

- 1 1. A circuit, comprising:
2 a nonlinear transmission line circuit having an input and an output; and
3 a pulse-forming circuit coupled to the nonlinear transmission line, the pulse-
4 forming circuit including a reverse-biased diode coupled to the output of the nonlinear
5 transmission line circuit.
- 1 2. The circuit according to claim 1, further including a co-planar waveguide in
2 which the nonlinear transmission line is disposed.
- 1 3. The circuit according to claim 1, wherein the circuit is fabricated from high-
2 resistivity silicon.
- 1 4. The circuit according to claim 1, wherein the nonlinear transmission line includes
2 a plurality of reverse-biased Schottky diodes coupled to a central conductor.
- 1 5. The circuit according to claim 1, further including a gate device coupled to the
2 pulse-forming circuit.
- 1 6. The circuit according to claim 5, further including a modulator coupled to the gate
2 and a laser coupled to the modulator for generating optical pulses.
- 1 7. The circuit according to claim 6, wherein the modulator is a 10 GHz LiNbO₃
2 modulator.
- 1 8. The circuit according to claim 7, wherein the circuit generates signals at a rate of
2 at least 10 Gbit/s.
- 1 9. The circuit according to claim 7, wherein the circuit generates optical pulses less
2 than about 27 picoseconds FWHM.

1 10. The circuit according to claim 7, wherein the gate is a dual-gate FET.

1 11. The circuit according to claim 10, wherein the gate is a Si/SiGe heterostructure
2 bipolar transistor.

1 12. A data transmission system, comprising:
2 a nonlinear transmission line;
3 a pulse-forming circuit coupled to the nonlinear transmission line;
4 a gate coupled to the pulse-forming circuit;
5 an optical modulator coupled to the gate; and
6 a laser coupled to the modulator.

1 13. The system according to claim 12, wherein the system is integrated on a silicon
2 substrate.

1 14. The system according to claim 12, wherein the gate includes a dual-gate FET.

1 15. The system according to claim 12, wherein the pulse-forming circuit includes a
2 reverse-biased diode.

1 16. A method of generating optical pulses, comprising:
2 electrically modulating an output signal from a pulse-forming circuit coupled to a
3 nonlinear transmission line; and
4 modulating an output signal from the pulse-forming circuit with a laser-generated
5 signal to provide an optical signal.

1 17. The method according to claim 16, wherein the pulse-forming circuit includes a
2 reverse-biased diode coupled to the nonlinear transmission line.

1 18. The method according to claim 16, further including inserting the nonlinear
2 transmission line within a waveguide.

1 19. The method according to claim 16, further including fabricating the nonlinear
2 transmission line from high-resistivity silicon.

1 20. The method according to claim 16, further including integrating a gate, the
2 modulator, the laser, the nonlinear transmission line, and the pulse-forming circuit on a
3 silicon substrate.